Light and Lighting

Official Journal of the Illuminating Engineering Society

Incorporating "The Illuminating Engineer."

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Lighting and Decoration

THE Illuminating Engineer is responsible for *the Lighting*, Yes.

But how far is he or can he be responsible for other factors which influence the effect of the lighting?

This was a question raised by Mr. Allpress in his recent paper (see p.24) and debated by several speakers in the discussion. The nature of the decoration of walls and ceiling, even the colouring given to inactive parts of machines is vital—not only in improving the illumination and softening shadows but in creating the all-important *background* to the lighted task.

In one way or other the Illuminating Engineer should make his influence felt, either by supervising the decoration or, better still, by enlisting the aid of an expert in colour and decoration and working with him.

But the problem does not end here. There are other factors in the chain of effects which influence lighting. More radical still is the suggestion once made by Mr. R. O. Ackerley that *the nature of the objects manufactured* may sometimes be modified to make lighting easier—e.g., they may well be of lighter tint or of less minute size if such changes do not prejudice their utility nor their acceptability to the public.

American I.E.S.

General Secretary's Report for 1944-45

It is always instructive to study the record of progress of our friends in the United States, so fully and graphically revealed in the annual report of their general secretary (Mr. Lee E. Taylor).*

The report for 1944-45 reveals many points of similarity with developments in our own country, though in America affairs are conducted on a more magnificent scale. The graph tracing the growth in membership reveals—as with the British I.E.S.—a very steep upward rise during the war period, a total membership of over 4,000 being now attained. But whilst the membership is thus rather more than *twice* that of the British I.E.S., the annual income (which has likewise expanded sharply) now reaches roughly 66,000 dollars, or, say, £16,000, which is more than *four* times that of the Society here. Roughly, half of this substantial sum is consumed in office expenses alone.

In several respects the societies seem to be moving on parallel lines. The distinction of Fellowship, introduced in this country shortly before the war, has been recently initiated in America, on very similar lines, though the conditions appear somewhat stiffer. Both societies are aiming at the production of handbooks on illuminating engineering, though the American effort is clearly the more ambitious. In both countries increases in the subscription rates have been sanctioned, apparently without any prejudicial influence on growth of membership. In one respect, the expansion of "Illuminating Engineering" (which corresponds to our "Transactions"), we have regretfully to give best to our friends in the U.S.A., where, apparently, there are no paper restrictions to vex the soul and cramp editorial efforts.

A novel feature in the current report is the series of photographs depicting the permanent staff at work. The first picture shows Mr. A. D. Hinckley (Executive Secretary), Mr. R. W. McKinley (Handbook Editor), and Mr. C. L. Crouch (Tech. Secretary) in consultation. (The two latter appointments are new full-time jobs, initiated for the first time last year.)

Other pictures illustrate the separate departments devoted respectively to publications, membership records, financial records, and stock room, where eleven additional members of the staff are seen at work. There may, of course, be others, but the above schedule alone accounts for *a staff of fourteen*, with each department separately organised and controlled.

Contrast this with the arrangements at 32, Victoria-street, where, even now, the honorary secretary (who also acts as Editor) has the assistance of a secretary and a staff of only three assistants. The increase in subscriptions adopted last year should ultimately enable some improvements to be made, but at the moment restrictions, shortage of available labour, and other legacies of the past six years make progress difficult.

* "Illuminating Engineering," Dec., 1945, p. 863.

Forthcoming I.E.S. Meetings

(Provisional List)

SESSIONAL MEETINGS IN LONDON

1946.

Mar. 12th. MR. G. T. WINCH on **Photometry and Colorimetry of Fluorescent and Other Discharge Lamps.** (*In the Lecture Theatre of the Institution of Mechanical Engineers, Storey's Gate, Westminster, S.W.*1.) **6 p.m.**

April 17th. MR. W. R. STEVENS on **A Specimen Lecture for Delivery in Schools.** (*Joint Meeting with the Science Masters' Association, to be held in the Imperial College of Science, S. Kensington.*) **5.30 p.m.**

MEETINGS OF CENTRES AND GROUPS

1946.

Mar. 1st. Paper on **Fluorescent Lamp Lighting.** (*At Heriot-Watt College, Chambers Street, Edinburgh*, 1.) **6 p.m.**

Mar. 1st. MR. E. W. MURRAY on **Lighting in Relation to Safety and Vision.** (*In the Lecture Theatre, City of Nottingham Gas Dept., Parliament Street, Nottingham.*) **5.30 p.m.**

Mar. 4th. DR. W. D. WRIGHT on **Brightness.** (*At Electricity Showrooms, The Headrow, Leeds.*) **6 p.m.**

Mar. 5th. DR. W. M. HAMPTON on **Glassware Manufacture with Particular Reference to the Lighting Industry.** (*In the Demonstration Theatre, City of Leicester Electricity Dept., Charles Street, Leicester.*) **6 p.m.**

Mar. 5th. DR. W. D. WRIGHT on **Brightness.** (*At the Sheffield University, Western Bank, Sheffield*, 10.) **6 p.m.**

Mar. 5th. MR. W. R. STEVENS on **The Design and Appraisal of Lighting Fittings with particular Reference to Fluorescent Lamps.** (*In the Liverpool Corporation Electricity Showrooms, Whitechapel, Liverpool.*) **2.30 p.m.**

1946.

Mar. 6th. MR. S. D. LAY on **Outdoor Lighting Practice.** (*In the Minor Hall, Oxford Street, Newcastle-upon-Tyne.*) **5.45 p.m.**

Mar. 7th. **"Any Questions?": Annual General Meeting.** (*At the Institute of Engineers and Shipbuilders*, 39, *Elmbank Street, Glasgow, C.*2.) **7 p.m.**

Mar. 7th. MR. L. G. APPLEBEE on **Colour and Directional Light as Applied to the Stage.** (*In the Reynolds Hall, College of Technology, Sackville Street, Manchester.*) **6 p.m.**

Mar. 7th. MR. W. R. STEVENS on **The Design and Appraisal of Lighting Fittings.** (*In the Bradford Electricity Dept. Showrooms, Sunbridge Road, Bradford.*) **6.45 p.m.**

Mar. 8th. **Annual General Meeting** and **Address by the President** (MR. H. C. WESTON). (*At the Imperial Hotel, Temple Street, Birmingham.*) **6 p.m.**

Mar. 12th. MR. W. R. STEVENS on **The Design and Appraisal of Lighting Fittings.** (*In the Electricity Showrooms, Market Street, Huddersfield.*) **7 p.m.**

Mar. 12th. MR. W. J. JONES on **Lighting, Past, Present and Future.** (*In the Reardon Smith Lecture Theatre, Cardiff.*) **6.15 p.m.**

Mar. 20th. MR. R. GILLESPIE WILLIAMS on **The Poetry of Light.** (*At the Cleveland Scientific and Technical Institution, Corporation Road, Middlesbrough.*) **6 p.m.**

Mar. 21st. MR. D. JONES on **Trend of Development in Fluorescence.** (*In Gloucester.*)

April 1st. MR. J. WARD on **Engineering Applications of Polarised Light.** (*At Electricity Showrooms, The Headrow, Leeds.*) **6 p.m.**

April 2nd. Paper on **Infra Red Radiation.** (*At Demonstration Theatre of the City of Leicester Electricity Department, Charles Street, Leicester.*) **6 p.m.**

(Secretaries of Centres and Groups are requested to send in particulars of any changes in programmes, mentioning subject, author, place, date and time of meeting; summaries of proceedings at meetings (which should not exceed about 250-500 words) and any other local news are also welcome.)

1946.

April 2nd. Mr. J. Ward on **Engineering Application of Polarised Light.** (*Electricity Showrooms, Market Street, Huddersfield.*) **7 p.m.**

April 3rd. Mr. W. J. Wellwood Ferguson on **Light and the Eye.** (*At Liverpool Corporation Showrooms, Whitechapel, Liverpool.*) **2.30 p.m.**

April 3rd. Annual General Meeting. (*At Minor Hall, Oxford Street, Newcastle-on-Tyne.*) **5.45 p.m.**

April 4th. Factory Lighting and Special Problems. (*At Bridgend.*) **3.15 p.m.**

April 4th. Dr. J. H. Shaxby on **Colour and the Eye.** (*At Reynolds Hall, College of Technology, Sackville Street, Manchester.*) **6 p.m.**

April 4th. Exhibition on Films. (*At Bradford Electricity Dept. Showrooms, Sunbridge Road, Bradford.*) **6.45 p.m.**

April 5th. Dr. Drummond Currie on **Vision and the Eye.** (*At Electricity Showrooms, Bath.*) **7.0 p.m.**

1946.

April 5th. Address by Dr. S. English. (*At Imperial Hotel, Temple Street, Birmingham.*) **6 p.m.**

April 5th. Annual General Meeting. (*At Heriot-Watt College, Chambers Street, Edinburgh*, 1.) **6 p.m.**

April 5th. Mr. R. Gillespie Williams on **Modern Stage and Colour Lighting.** (*At Lecture Theatre, City of Nottingham Gas Dept., Parliament Street, Nottingham.*) **5.30 p.m.**

April 8th. Mr. J. S. Preston on **Photometry in Theory and Practice.** (*At Sheffield University, Western Bank, Sheffield.*) **6 p.m.**

April 18th. Lecture on Gas Applications. (*At Cheltenham.*)

April 25th. Annual General Meeting and Luncheon. (*Park Hotel, Cardiff.*)

April 29th. Address by the President (Mr. H. C. Weston). (*At Sheffield University, Western Bank, Sheffield*, 10.) **6 p.m.**

April 30th. Annual General Meeting. Address by the President (Mr. H. C. Weston). (*At Electricity Showrooms, The Headrow, Leeds.*) **6 p.m.**

E.L.M.A. Forty-Second Illumination Design Course

The forty-second Illumination Design Course at the E.L.M.A. Lighting Service Bureau commenced in London on Thursday, February 28, when Mr. E. B. Sawyer give the introductory talk on "The Relation between Light and Vision." The programme for subsequent Thursdays comprises "Illumination Design for Interiors" (Mr. A. D. B. Atkinson), "The Development of the Electric Lamp" (Mr. A. G. Penny), "Fluorescent Lamps" (Mr. C. Bicknell), "Lighting Practice of the Future" (Mr. W. Robinson), and "Light in the Home" (Mr. T. O. Freeth). From photographs of the audience it is evident that the attendance will be quite up to previous records. It is interesting to learn that additional evening courses are now being organised, both in Leeds and in London. The adjacent illustration shows preparations for demonstrations in full swing.

A New Standard Specification for Street Lighting

(Specially contributed)

The following summary and analysis of the B.S.I. Specification for Street Lighting and the recent I.E.S. discussion thereon has been specially prepared in response to the interest expressed in that discussion and the desire for fuller information on this subject.

As reported in the last number of "Light and Lighting,"* the meeting of the Illuminating Engineering Society, held at the Institution of Mechanical Engineers on January 8, was devoted to a discussion of the draft British Standard Specification for Street Lighting, recently circulated for comment.

Dr. J. W. T. Walsh first briefly surveyed the historical background, starting with the original Specification (No. 307), in which installations were classified on the basis of the illumination of the road surface at a stated "test-point." The great trouble with this was that, although the Specification emphasised that this test-point illumination should not be used as a yard-stick in assessing the relative merits of different installations, it was, in fact, frequently so used. With all its defects, however, this Specification did much to assist the improvement of street lighting in this country in the period between its publication and 1937.

In that year the Ministry of Transport Committee issued their final report, which inaugurated a new era. The illumination at any given point ceased to be the predominant factor, even as a basis of classification. Roads were divided into two groups, viz., traffic routes (Class A) and all other lighted roads (Class B), and recommendations were made as regards such matters as mounting-height, spacing, overhang, etc., in addition to the amount of light to be provided per 100 feet of road. The report was not, of course, in specification form, and the committee made a strong recommendation that their principal conclusions should be incorporated in a British Standard Specification at the earliest possible moment.

In compliance with this suggestion the B.S.I. Committee put in hand without delay the drafting of such a specification, and this work was in active preparation when war broke out. The drafting sub-committee's principal difficulty was to find a satisfactory method of checking the performance of an installation, either by laboratory test or on the road, and many were the proposals they examined and rejected.

When work was resumed about a year ago, the main committee had to consider very carefully proposals which had been made at different times that the whole matter would be better dealt with by means of a Code of Practice than by a Specification. After a long discussion their decision was emphatically in favour of a specification, and the sub-committee was therefore instructed to proceed on those lines.

In order to simplify its task as far as possible the sub-committee decided to deal with the two classes of roads separately, and the present draft was that of a specification for Class A, i.e., traffic routes only. It was hoped to prepare a

* January, 1946, pp. 14-15.

separate specification for Class B when experience had been gained with the present proposals.

The draft specification was divided into three parts dealing respectively with (I.) mandatory requirements with which all installations should comply, (II.) principles to be adhered to as closely as possible, having regard to the prevailing conditions, and (III.) such matters as maintenance, information to be supplied with the tender, etc.

The clauses in Part I. specified (i) a mounting height of 25 ft., with a certain tolerance, (ii) a spacing in accordance with the report of the M.O.T. Committee, (iii) arrangements of posts and overhang of lanterns, also following the recommendations in that report, (iv) the M.O.T. range of luminous flux output, viz., 3,000 to 8,000 lumens per 100 ft. run of roadway, and (v) a laboratory test for the light distribution from the lanterns and a road test of lantern performance. These last two tests were dealt with more fully later by Mr. J. M. Waldram and Mr. F. C. Smith respectively.

The clauses in Part II. dealt with the arrangement of the lanterns on streets of various breadths and having different characteristics and different features calling for special treatment. In particular, bends, T-junctions, cross-roads, roundabouts, and dual carriageways were all considered, and guidance was given as to the most appropriate methods of siting the lamps in order to meet the special requirements of such features. It would be clear that in Part II. it was impossible to lay down hard and fast rules, and, therefore, while in Part I. the verb employed was the mandatory "shall," in Part II. this was replaced by the wishful "should." In brief, it might almost be said that Part I. was a specification proper and dealt with all those matters suitable for inclusion in such a specification, while Part II. was more in the form of a code of practice.

In Part III., clause ii prescribed a test for maintenance which was, of course, mandatory, while the other clauses set out the various items to be included in the information to be supplied (a) with the enquiry and (b) with the tender.

Of the three appendices, the first gave a general description of the various types of light distribution available and mentioned the circumstances in which each would find its most appropriate application. Appendix B described a gauge designed to assist in siting at bends while appendix C gave a definition of the "directional intensity ratio" of a fitting, the definition being slightly different from that adopted by the M.O.T. Committee.

Mr. F. C. Smith then dealt with that part of clause v which specified a test on the roadway to ensure that the performance of the installation was satisfactory. The illumination of a vertical surface was measured at a point 3 feet above the kerb and almost opposite a lantern mounted on the other side of the road. It was, however, displaced 2 feet towards that lantern on its own side which provided most of the illumination. The foot-candle reading obtained was multiplied by the square of the distance to this dominant lantern (in feet) and the result was called the "acceptance number," as this number had to reach a certain value in order that the installation might be regarded as acceptable.

So far only one arrangement of lanterns (the staggered system) and one general type of light distribution had been dealt with in this clause, but others would be included at a later stage if this form of test was adopted. The acceptance number was in no sense a measure of the excellence of the installation; it was purely a form of "go" or "no-go" gauge which the installation had to pass.

Passing on to speak of the maintenance clause, Mr. Smith said that the acceptance number was measured after the installation had been in use for between 75 and 100 burning hours. The number found as a result of subsequent tests had then always to be within a certain percentage of this original number, which was taken as the basis. The actual percentage was a matter for

agreement between the parties using the specification.

Mr. J. M. Waldram first of all pointed out that what the borough engineer was concerned with, when buying a street lighting installation, was visibility or revealing power and he showed diagrammatically the many factors which went to make up this intangible quantity. It could not be tested directly, so all the engineer could do was to apply some form of test which had been found in practice to provide an indirect assurance that the revealing power would probably be satisfactory. Such a test was the laboratory test of light distribution laid down in clause v of the draft specification. The plane in which the distribution was determined was the plane parallel to the street axis and not the plane passing through the maximum candle-power. This was done deliberately to safeguard the appearance of the street. The requirements had been set somewhat low because only a small number of lanterns would generally be tested and on statistical grounds a maker would have to aim at a considerably higher figure in order to be sure of passing, having regard to the probable extent of the variations between lanterns.

The discussion was opened by Dr. English who said that if the acceptance number was a hurdle which the installation had to surmount, it became in fact a figure of merit whether it was so intended or not. He felt, too, that it was impossible to define the distribution to be given by lanterns without stultifying development and discouraging experiments which might lead to progress. He recalled that as a result of a discussion some time ago the Society had expressed a strong preference for a code of practice and he was still of the opinion that this was the right way to deal with the matter.

Mr. T. Wilkie pointed out that maintenance was of vital importance in securing good street lighting and he would have liked to see more explicit requirements in the part of the specification dealing with this matter. He also said that siting was often not under the control of the lighting engineer, especially where there were tram poles, nor was the road surface his concern, although this had such a marked effect on the visibility given by a lighting installation.

Mr. Hartill emphasised the importance of illuminating the background, including the footway, fences and buildings flanking the street. He felt that more light should be directed to these than to the roadway itself in order to secure better visibility conditions.

Mr. Cunnington and Mr. North both urged that nothing should be done to discourage enterprise and the desire to experiment in street lighting. Mr. Cunnington showed an unusual arrangement of street lanterns which he said he would like to see tried out in practice, although he felt that it would not come within the provisions of the specification. Mr. North (Borough Surveyor of Merton and Malden) would have liked the colour of the light specified and the nature of the road surface defined.

Mr. L. T. Minchin, who, with Mr. F. C. Smith, had been largely responsible for the development of the clause dealing with the acceptance number, said that this number had been based on a study of brightness distribution on the road. It gave an idea of the candle-power of the lantern in that direction which was of primary importance in the production of good road surface brightness.

The meeting concluded with brief replies by the three members of the drafting sub-committee who had opened the discussion.

SITUATION WANTED

ILLUMINATING ENGINEER, aged 26, requires post with progressive firm. Has had eight years' experience on testing and design of lighting fittings equipment. —Write, giving details of work required, salary, etc., to Box 304, "Light and Lighting," 32, Victoria-street, London, S.W.1.

Design and Performance of Industrial Lighting

(Proceedings at the I.E.S. Sessional Meeting held in London on February 12th, 1946)

There was an excellent attendance at the Lighting Service Bureau on February 12 to hear the paper by Mr. H. Allpress on the above subject. The author has had exceptional experience of these problems, at the Ministry of Supply as well as in other capacities, and the paper dealt with a number of points of considerable practical interest. It would, however, doubtless have benefited by condensation, at least in delivery. When authors hold forth for an hour and a half they are certainly asking for trouble. The rapid dispersal of the audience after such a period is significant, and naturally deprives the author of any adequate opportunity for a full discussion. Nevertheless, in the small time available, Mr. F. L. Cator, Mr. S. Lay, Mr. J. Ashmore, and others did raise some useful points. It was pleasant to note that the three opening speakers were all prominently associated with I.E.S. centres. We hope that those responsible will continue to be mindful of the desirability of securing the attendance of a few selected members from a distance at London meetings.

Temperature Problems

The first part of the paper was concerned mainly with the design of fittings and accessories. Mr. Allpress dwelt at some length on problems connected with temperature. There is not a sufficiently clear understanding as to what is meant by "cool wiring," and it is suggested that makers should state the temperature permissible in practice, e.g., in connection chambers or lampholder terminals. Reference was also made to variations in the quality of vitreous enamel (now being studied by a B.S.I. panel). The quality described as "ability to keep clean" is important, but reflectivity should also be specified.

"Dust-proof" Fittings

Something was said about "dust-proof" fittings, which are not always in fact dust-proof, and the author deprecated the practice of attaching so-called dust-proof visors to open reflectors; this practice may actually lead to greater deterioration through the suction of dust into the inner parts. More consideration should be given to the use of reflectors of sufficiently large dimensions to be operated satisfactorily without overheating or special ventilation. Another question touched upon was the earthing not only of polished metal parts but also of enamelled surfaces of reflectors, etc., which can be done by the aid of a special screw and washer. Various practical suggestions for improving the safety of lampholders and securing a greater degree of standardisation were made. The use of key or push bar lamp-holders is undesirable. Protection of low voltage circuits by means of a cut-out in the secondary circuit is advised.

An interesting topic, well illustrated by the author, was the effect of dust deposits, especially those associated with the changeover from fuel oil to heavy fuels of the creosote pitch type. Mr. Allpress showed by demonstrations how deposits of such materials may impair insulation and lead to smouldering —even when the distance between the terminals is relatively great.

Optical Qualities of Reflectors

Turning to the optical qualities of enamelled reflectors, Mr. Allpress showed how little effect the nature of the contour has on the polar curve of light distribution, the effect of so-called

"dispersive" and "concentrating" types being substantially similar, except for some difference in the small area immediately under the source.

The next section of the paper was concerned with general lighting problems, the author laying stress on the design of installations to comply with the specific requirements of manufacturing processes. Some doubt was expressed whether "general lighting" could be designed to answer equally well irrespective of changes in the layout of plant, and the provision of alternative points for lighting fittings was suggested. It was pointed out that conditions of local lighting need to be specified with greater precision—wattages of local lamps may vary from 12 to 150—and the importance of light surroundings was strongly emphasised.

Value of Light Surroundings

This applies not only to walls and ceilings but also to the machines themselves. The improvement due to finishing machine tools a light cream has to be seen to be believed. (In the course of the subsequent discussion some doubt was expressed, however, whether "decoration" should come within the scope of the lighting engineer, even though admittedly the results of his efforts depend so greatly upon it.)

Brief reference was made to the need for greater precision in estimating the depreciation allowance and to lessons to be learned from experiences of A.R.P. lighting during the war (such as the paramount importance of avoiding glare).

Special Industrial Lighting Problems

Mr. Allpress next proceeded to analyse a number of special lighting problems. Amongst these are the best means of illuminating various special articles such as those of a highly polished or semi-transparent character. He also emphasised the great value of illuminated magnifiers for use in the examination of very small objects almost beyond the power of unaided vision.

One very interesting question is the illumination of processes in which temperature is believed to be judged by observation of glowing material. Mr. Allpress went into this matter in detail and presented the results of a number of practical tests. These revealed certain curious phenomena, but they did apparently dispose of the idea that the provision of a moderate illumination is any real handicap in processes of this nature.

In the concluding section of the paper the author made some suggestions in regard to maintenance, in connection with which he quoted some useful figures for the average lighting hours in factories.

Finally, the view was expressed that, with the passing of war-time measures, the need for good industrial lighting remains as great as ever.

Visits

I.E.S. Centres and Groups throughout the country have shown commendable enterprise in the arrangement of their programmes. There is one idea worth following up—both by them and by Headquarters when opportunity affords—the arrangement of occasional visits as an alternative or an as addition to regular meetings.

We notice two recent events of this kind that seem to have been very successful, and for which the Leicester and Sheffield Centres were respectively responsible. On February 5 members of the Leicester Centre visited the works of the British Thomson Houston Company, Ltd., travelling to Rugby by motor-coach and inspecting sections devoted to the manufacture of both tungsten filament and fluorescent lamps; a brief visit being also paid to the turbine and large machine shops where large turbo-alternators and other plant were in course of construction.

On January 3 the Sheffield Centre, in conjunction with the Yorkshire section of the Society of Glass Technology, visited the glass works of Messrs. Wood Bros., Barnsley, where a meeting was held and a paper entitled "Lighting in the Glass Industry" was read by Mr. J. K. Marsden, a past chairman of the Centre. The subsequent visit to the works, following which the party (about 100 strong) were entertained to tea, proved to be of great interest.

SESSION 1945-1946

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Mr. T. Wilkie (1943)
Mr. G. T. WINCH (1944)
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* Retirement on completion of period of filling a casual vacancy.

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Mr. N. V. Everton (1943)

Hon. Secretary :—
Mr. J. Stewart Dow (1928)

The names in italics are those of retiring Officers or Members. The date in parentheses after each name indicates the date of election to Office or Membership of the Council.

The Illuminating Engineering Society

32, VICTORIA STREET, LONDON, S.W.1

ELECTION OF OFFICERS AND COUNCIL

SESSION 1946-1947. OFFICIAL NOTICE

IN accordance with the procedure specified in the Articles of the Society, a list of existing Officers and Members of Council, of vacancies occurring and of duly qualified persons nominated by the Council for vacancies about to occur in the offices of President, Vice-Presidents, Hon. Treasurer, Hon. Secretary, and Ordinary Members of Council, is presented below for the information of the Members of the Society.

In the event of any Members desiring to put forward other names, the Council will be pleased to receive such nominations, which should be made in accordance with the following rule (Article 48):—

> "After the issue of the Council's list, and not later than the 15*th day of April* next following, any ten Members (but no more than ten) may nominate any other duly qualified person to fill any such vacancy by delivering such nominations in writing to the Hon. Secretary, together with the written consent of such person to accept office if elected, but each such nominator shall be debarred from nominating any other person for the same office at such election."

Nominated by the Council to fill Vacancies:—

***President*:—**

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Lighting Progress in U.S.A.

In what follows we give a summary of the "Progress Report" prepared by the American I.E.S. (*Illuminating Engineering*, December, 1945) dealing specially with developments during the period of the war.

In addition to the usual annual report of the general secretary of the American I.E.S. (see page 18), the December, 1945, issue of "Illuminating Engineering" contains a report on progress in the lighting industry, in which reference is made to various interesting war-time applications of light.

The actual growth in lighting during the war period has been outstanding. Approximately 850 million lamps were sold in 1944, 180 per cent. of the number in 1938. The consumption of fluorescent lamps trebled in 1941 and then doubled in subsequent years, attaining a record of 35 million units in 1945. The energy consumed for lighting rose above 60,000 million units, 200 per cent. of that used in 1938.

This increase was largely associated with the national war effort. New experience of high-level illumination in industry was gained. At the same time useful knowledge was acquired under very low levels of illumination, e.g., as a result of the black-out and in night operations.

New Sources of Light

Amongst a considerable number of special new sources of light introduced interest attaches to the long and thin "slimline" fluorescent lamps, intended for such applications as showcase lighting and in circumstances where a narrow "ribbon of light" is desired. Also of interest is the "circline" 32-w. fluorescent lamps made in the form of a circle and provided with special accessories for its support. Other types mentioned include small fluorescent tubes consuming only 6, 8, and 13 w., certain forms of lamps for use on d.c. circuits and lamps furnishing a new intermediate quality of "white light." A 1-w. bulb fluorescent lamp has been introduced for night light and safety light use, chiefly in the home. Christmas-tree lamps, using glow-lamp discharge through krypton and other rare gases to generate u.v. radiation to activate phosphors, are also mentioned.

Much ingenuity has been expended on the design of ballasts, lamp holders, etc., and a black filter glass tubing (for which plastic filters may substitute) has been developed for use as envelopes to appropriate sources.

Applications: General Lighting

Turning to technical advances in the application of light reference is made first to certain practices in general illumination. The "grid" system of mounting fluorescent tubing, in lines at right angles, is stated to furnish "a better brightness pattern on the work," presumably associated with better shadow conditions. Semi-indirect fluorescent general lighting has proved to have advantages, and in certain instances supplementary "low brightness" bare fluorescent tubing is useful. Combinations of general fluorescent lighting with spot lighting from tungsten filament units has been tried out for merchandise areas, in order to get the requisite addition, to highly diffused general lighting, of a directional component. Photographs of installations are reproduced to illustrate current practice, illuminations in certain cases being as high as 100 ft.c. An installation of short-ray ultra-violet radiation, to reduce airborne bacteria, is described, and a picture of an experimental street lighting installation, with fluorescent lamps mounted at 45 deg. on poles along the curb, is reproduced.

Applications of Light in Warfare

Developments in specific lighting fields naturally include many war-time activities. Armies, always on the move, constantly need light, quickly and for un-

foreseen uses. Portable power generating units, varying in size from a small dry cell up to a 5,000 kw. power plant, built on a railway train, were designed. Tractor-type power shovels were floodlighted, landing strips for airborne units illuminated from airborne lighting kits. Artificial moonlight, searchlights, signal lights and indicators, lamps for deep-sea diving, etc., were in use in large numbers. Noteworthy is the rugged "high impact" filament lamp used on all U.S. Navy ships, utilising tungsten wire of special robust crystal structure, coiled on a small mandrel to high pitch and capable of resisting almost anything but a direct hit. Another valuable item was the gunsight lamp—a complete optical projector within a frosted and silvered lamp the size of a walnut—to concentrate intense light (such as will stand out in bright sunlight) on the reticule of the sight, creating the sight rings used for aiming. Complete lighting kits for use in lighting emergency airports were designed.

Use of Luminescent Material

Luminescent material was also used on a large scale. Besides the use of fluorescent instrument dials "phosphorescent tape" was very widely used to reveal objects in darkness. Other applications included the fluorescent suit and fluorescent signal-paddles used by aircraft landing officers standing in the beams of black light projectors. Packets of fluorescent dye, glowing a brilliant yellow under the u.v. rays in daylight, were thrown into the water by pilots downed at sea and served as guides to search planes. Fluorescent signal flags, more readily visible at a distance than any others, were widely used. During the last days of the "Belgian Bulge" 10,000 lb. of brilliant fluorescent-dyed identification panels were flown daily to Europe to be used by the ground forces so that they might be safely identified by the Allied forces. At a time when much equipment was captured by the enemy, and it was difficult to distinguish friend from foe, these proved invaluable.

General Developments

Ordinary lighting developments have naturally been less noteworthy than those recorded above. There is mention, however, of some interesting developments such as the fluorescent lighting of railway cars, the record lighting of recently completed airports, model school lighting installations, and the progress attained in connection with farm lighting. Special fittings for use with fluorescent tubes, such as those provided with louvres, are of interest as showing the tendency towards screening. Much attention has been given to the maintenance of very large installations. Striking new equipment, such as elevating service towers and ladders permitting attention to lamps 50-100 ft. from the floor, is illustrated.

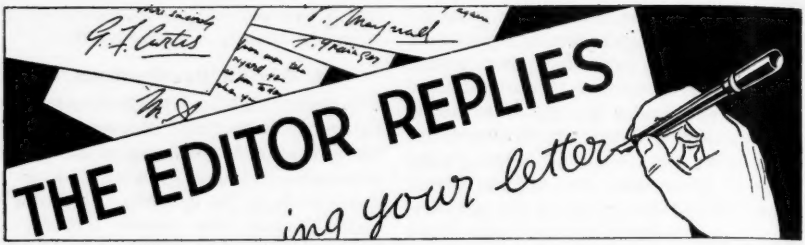
A final section refers to developments in Europe. Developments in Great Britain, illustrated by a familiar picture showing the illumination of a foundry by fluorescent skylights, are briefly recorded.

Lectures on Lighting

Considerable interest attaches to the Joint Meeting of the I.E.S. with the Science Masters' Association on Wednesday, April 17, when Mr. W. R. Stevens will present a specimen lecture for use in schools on "The Wonders of Lighting."

We gather that this will be on similar lines to the talks given in London and elsewhere last Christmas, though doubtless experience may suggest some improvements.

If the actual lecture can be reprinted in pamphlet form, with appropriate illustrations and hints on apparatus (which should be as simple as possible) this may serve as a useful guide both to school teachers and future I.E.S. lecturers. It is to be hoped that the lecture, with any necessary local modifications, may be taken up by science masters, for they will probably have much of the needful apparatus to hand, and in many cases could doubtless fit it into the school curriculum.



Some comments have reached me on the idea of illuminating large outdoor areas by means of captive **lighting sources at great heights,** discussed in our December issue (p. 183). It is natural to be sceptical about the performances of lighting units mounted 5,000 ft. high. I notice, however, that users of light are still often uneasy at the idea of mounting units at such heights as 25 ft. to 30 ft., or even 16-20 ft., believing strongly in the detrimental effect of **the inverse square law** or fearing the effects of atmospheric absorption.

In regard to the former it should be understood that effects of greater distance may often be largely counteracted by the use of more concentrating reflectors, and that high-mounting systems are not necessarily less efficient than those based on units mounted at a low level. In the case of **fluorescent lamp installations,** where conditions often approach those characteristics of an overhead luminous plane, the effect of distance on the available illumination is, of course, often very much less than the application of the inverse square law would suggest. Indeed, in some circumstances the illumination is **almost independent of distance.**

Arguments based on the absorption of light at relatively large distances between the source and the surface illuminated have doubtless more behind them, especially in the case of outdoor areas. Some reference to this factor was made in the previous issue, mentioned above. It is interesting to note, however, that in America high mounting in very large industrial interiors is apparently quite usual, and a recent issue of "Illuminating Engineering" contains pictures of maintenance ladders and lattice masts mounted on trollies to permit attention to sources at heights of 50 ft. and even 100 ft.

My attention has been drawn to the unfortunate experiences of certain **shopkeepers** in Swindon who appear to have been fined for **"waste of light"** occasioned by the exposure of certain lamps in their windows. I have been asked what is the exact position in regard to such matters. I believe that the regulation forbidding shop window lighting and all display of light for purposes of advertisement remains in force. Occasionally however lamps used to illuminate the interior of a shop are permitted to shed some light on the contents of windows and, by some ingenuity in this respect, merchants may still be able to give some indication of what they have to offer.

The performances of **fluorescent lamps** continue to prove a popular subject of discussion. I find a fairly general preference for the "warm white" colour, certainly for display (even in florists' shops) and in restaurants and such places where an impression of "comfort" (how difficult to define!) is aimed at. In this respect agreement has been expressed with the views of Professor Cotton, quoted in our last issue (p. 13). It is well to remember that a number of years have already passed since these lamps were introduced. As a result, certain weaknesses, e.g., a tendency to

flicker when a heavy load is put on an industrial circuit, are much less apparent.

Another result of experience, apparently, is a steady and progressive **improvement in average life.** I understand that under reasonably good conditions an efficient life of 4,000 hours or more may well be expected. This certainly affects materially calculations of the relative costs of fluorescent and tungsten filament lighting—though the latter is likely to persist for years to come; indeed, there are often advantages in a combination of the two methods.

The wide ground covered in the recent I.E.S. paper by Mr. Allpress is likely to give rise to many profitable subjects for discussion. One of these is the **effect of size and shape of reflectors** on light distribution. In one sense, both are always important—for, obviously, a reflector so shallow as to embrace only a small fraction of the light emitted by a lamp can have little effect on its distribution. Moreover, we have always a combination of the direct light from the source and the reflected light from the inner surface of the shade or reflector, and the latter becomes more and more important as greater depth of the enveloping surface intercepts more of the direct rays.

Apart from this, the contour of the reflector only becomes of substantial importance if **the inner surface is polished.** A strictly matt reflecting surface behaves like a luminous disc and gives the corresponding polar curve with a maximum immediately underneath. A **white enamelled surface,** which yields a mixture of diffused and polished reflection, behaves in an intermediate manner. Even so, the tests quoted by Mr. Allpress suggest that the effect of change of contour on the polar curve of light distribution is only apparent over a small area immediately under the source, and the division of such units into "extensive," "concentrating," etc., is doubtless largely illusory.

With polished reflectors much greater control of the light is possible, and more concentrating effects may be secured. Since the candle-power in any direction depends on the visible reflected image of the light-source, it is obviously easiest to gain high multiplying power with **small and intensely bright sources.** For this reason—as Mr. W. R. Stevens showed in an informative paper before the I.E.S. some little time back—no very great accentuation of candle-power can be obtained with extensive sources of low brightness, such as fluorescent lamps.

SITUATIONS VACANT

DESIGNER of commercial and industrial lighting fittings for fluorescent discharge and tungsten lamps, required for London by large electrical manufacturers. British national with electrical and illumination training and practical experience.—State salary required and full particulars to Box No. 604, "Light and Lighting," 32, Victoria-street, London, S.W.1.

IMPERIAL CHEMICAL INDUSTRIES, Plastics Division, require an Illumination Engineer for development work on the application of Plastics in the lighting field. This is a new post, carrying special responsibilities for a man with the necessary scientific background, coupled with real practical experience of design and lay-out. The ability to equip and control a special laboratory would be an additional qualification.—Write for application form to the Staff Manager, Imperial Chemical Industries, Ltd., Plastics Division, Black Fan-road, Welwyn Garden City, Herts, quoting Ref. No. LL/3.

LIGHTING FITTINGS and illumination commercial technical work. Large electrical manufacturers require for London office well-educated British subject with electrical and illumination training and commercial experience. Varied work, sales correspondence, lighting schemes, etc. Permanent, progressive post.—Particulars and salary required to Box 200, "Light and Lighting," 32, Victoria-street, London, S.W.1.

The Trend of Fittings for Fluorescent Lamps

An interesting paper on the above subject was read by Mr. W. R. Stevens before the I.E.S. Glasgow Centre on February 7, when Mr. F. M. Hale presided.

At the conclusion of formal business the chairman made a special reference to the presence of Mr. Howard Long, who, at his request, said a few words to members. The chairman referred to the very useful efforts of Mr. Long in visiting in turn so many of the I.E.S. Centres, and they appreciated particularly his inclusion of Glasgow in his tour.

The chairman then introduced the speaker of the evening, referring to his long and friendly association with Mr. Stevens and to the excellent work which he had done for the Society.

Mr. Stevens explained that although the subject originally arranged was the trend of fittings for fluorescent lamps, he had decided to give it wider scope, and would deal with the difficulties of the designers with fittings in general, and with particular reference to the fluorescent lamp.

By means of a light beam and various reflecting surfaces, e.g., plain and ribbled glass, opal glass, and various metals, Mr. Stevens demonstrated the characteristics of reflection and diffusion, etc. The speaker gave some idea of the means available for the control of light sources. He explained that the high brightness values and smaller light source of the tungsten filament lamp made designing an easier problem than was the case with the long light source and low brightness of the fluorescent 5 ft. 80-watt lamp.

A slide showing the light distribution of a 5 ft. trough finished white inside, illustrated that the result was very similar to the circular distribution of the standard dispersive reflector. Other slides dealing with particular laboratory tests were shown.

Mr. Stevens concluded his address by showing a film dealing with street lanterns. This illustrated the vibration which lanterns were subject to when mounted on trolley-bus standards; also a works destruction vibration test and the testing of the lantern and glass for rain conditions.

In the subsequent discussion a number of members took part, and after Mr. Stevens had briefly replied to points raised, a cordial vote of thanks was passed to him on the invitation of Mr. Macnaughton.

In conclusion of the address, Mr. Hale mentioned that the next meeting would be "Any Questions" night in addition to the annual general meeting, and appealed to the members to send in their questions not later than February 26. He also stated that there was every possibility of a visit to the works of Messrs. Fibre Glass, Ltd., taking place on the evening of March 14.

Informal Discussions

The "Brains Trust" items not infrequently introduced into their programmes by Centres and Groups, sometimes in order to fill a gap, are by no means to be despised.

Another kind of event which gives variety to the programme is the informal discussion, preferably on some highly controversial topic permitting lively contributions of the "Have at Thee" variety at one time encouraged by the Australian I.E.S. Such discussions may be both entertaining and informative, but they need careful prearrangement, especially on the part of the introductory speakers. Sometimes a surprise element in the form of distinguished visitors (disguised I.E.S. members) may help to maintain interest. We seem to remember an eminent Chinese, reinforced by a written contribution from an Eskimo, who participated in a certain meeting in London. Such fancies, however, should not be allowed to run riot.

Bright Light Sources (Part II.)

By Dr. J. N. ALDINGTON

(Trans. Illum. Eng. Soc. (Lond.), February, 1946)

Although, as previously announced, it has been found possible to resume distribution of *Light and Lighting* and ordinary issues of the I.E.S. Transactions to *all* members, the Paper Restrictions do not render it possible to deal in this way with papers of exceptional length.

Accordingly, it has been decided to limit the distribution of the **February (1946) issue** of the Transactions, containing **Dr. Aldington's paper,** which will be sent to libraries and such bodies as require the Transactions for permanent reference, but only to those I.E.S. members who make application for it (which all members who are in the habit of retaining copies and binding them in volume form will naturally do).

Members who wish to receive the February issue of the I.E.S. Transactions, which will be available very shortly, are accordingly requested to fill up and return to the Hon. Secretary the attached form.

It will be recalled that similar procedure has been adopted in regard to other papers of a lengthy and somewhat specialised nature. Besides easing the situation in regard to paper, this practice may facilitate the publication of more papers of wide and general interest.

This form to be returned to the Hon. Secretary of the Illuminating Engineering Society, 32, Victoria Street, London, S.W.1.

I.E.S. Transactions, February, 1946

Please send me the issue of the Transactions for February, 1946, containing the paper entitled "Bright Light Sources (Part II.)," by Dr. J. N. Aldington.

Signature of Member.....

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Name and Address to which copies should be sent.

In clear block letters.

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Lighting Reconstruction Pamphlets

Readers are reminded that copies of the series of Lighting Reconstruction Pamphlets are still available on application to the Illuminating Engineering Society (32, Victoria-street, London, S.W.1).

It will be recalled that the first five of the series are all available at the same rate (single copies 1s. each, 9s. per dozen, £3 per 100). The titles are as follows: No. 1, "The Principles of Good Lighting"; No. 2, "The Lighting of Public Buildings"; No. 3, "The Lighting of Schools"; No. 4, "Natural Lighting"; No. 5, "Public Lighting in the City and Highway."

The sixth of the series, "Making Work Lighter," which carries illustrations by Fougasse, is issued at the special flat rate of 6d. a copy.

I.E.S. Convention May 14-16, 1946

It is particularly hoped that this gathering will afford an opportunity for members from all parts to meet each other and that all the Centres will be well represented.

From replies already received to the circular notice recently issued to all members it is already evident that a good attendance will be secured.

In view of the limited possibilities of entertainment at the present time, it may well be necessary to limit attendance for evening events. In the meantime it will be very helpful, as a guide to numbers, if all members desiring to attend will kindly fill in and return the reply slip (if they have not already done so).

We have been asked to repeat that morning dress will be general for evening social events.

Colour Measurement

At the meeting of the Colour Group held at the Royal College of Science on January 30, two papers were read, each describing an instrument designed for the measurement of colour. Mr. R. Donaldson, of the National Physical Laboratory, showed a colorimeter with six matching colours instead of the usual three. He explained that the advantages of this arrangement were twofold. With only three instrument colours there was a very great difference of energy distribution between the light being measured and the mixture which gave a sensation colour match. This sometimes led to considerable differences between the results obtained by different observers. With the six colours, viz., red, orange, yellow-green, green, blue-green, and blue, the energy distribution was similar on both sides of the matching field and so the personal error was much reduced; in fact, it was practically eliminated, as shown by some diagrams of individual observations which Mr. Donaldson put on the screen.

The other advantage was that this nearer approach to an energy match made it possible to use a large (15 deg.) field, instead of the 2 deg. field generally found necessary when the match was made with only three colours. The form of field adopted was the familiar Lummer-Brodhun contrast pattern and in this way the sensitivity of the measurement was vastly improved.

The second instrument was a direct-reading photoelectric spectrophotometer, which was described by Mr. T. B. Davenport, of Imperial Chemical Industries (Dyestuffs Division). The instrument was primarily designed for measuring the spectral reflection curves of coloured surfaces in the spectral range 400-660 μ. Light from a monochromator entered an integrating sphere through a small aperture and illuminated either a magnesium oxide standard or the material to be measured. A wide window of the sphere was occupied by the photoelectric apparatus embodying an electron multiplier type of photocell with an a.c. amplification system and band-pass filter, eliminating zero drift and giving a high signal-to-noise ratio. Apparatus for modulating the light at a fixed frequency was incorporated so that a.c. rather than d.c. magnification would be employed. A device included in the optical system ensured that a constant band-width (10 μ) of the spectral illumination was provided throughout the wave-length range.

Mr. Davenport said that with this instrument it was possible to plot a complete spectral reflection curve in about 15 minutes, on the average. The accuracy was about 1½ per cent. of the actual reflection factor. The long-wave limit of the spectral range of the instrument was set by the type of electron multiplier available.

Both papers were discussed together and both authors were plied with questions regarding various details of the instruments. Mr. Donaldson explained that the contrast type of field was used because it was more sensitive than the ordinary equality of brightness field; a slight colour-difference, he said, appeared to be magnified when the contrast pattern was used. Mr. Davenport described tests which had been carried out to check that stray light had been eliminated. He explained that the instrument has been constructed in war-time with such components as were available. Its advantages include moderate cost, compactness and ability to function unaffected by neighbouring mechanical or electrical disturbances.

Mr. D. J. Sawkins: New Appointment in India

We learn with interest that Mr. D. J. Sawkins has been appointed to an important managerial position with Messrs. Philips Electrical Co. (India), Ltd., Calcutta, and will probably be leaving England within the next six weeks. Mr. Sawkins was largely responsible, in connection with the late Mr. E. J. Ireland, for the founding of the I.E.S. Bath Group, now incorporated in the Bath-Bristol Centre. He acted as honorary secretary of the Centre for two years, and during the present session became vice-chairman. All members of the I.E.S., for whom Mr. Sawkins has done such excellent work, will join us in wishing him every success in his new work.

Colour Discrimination

At the November meeting of this Group, held at the Elma Lighting Service Bureau, Mr. J. G. Holmes, of Messrs. Chance Bros. and Co., Ltd., gave a very interesting lecture on "Colorimetry in the Glass Industry."*

At the twenty-fifth meeting of the Group, held on December 19, Dr. W. S. Stiles gave a lecture on "Colour Discrimination, the Visibility Curve, and the Trichromatic Theory."

The first part of the lecture was devoted to an historical account of the work done on colour discrimination in relation to the trichromatic theory, first by Helmholtz and then by König and by Schrödinger. Helmholtz developed an algebraic expression for the threshold of colour discrimination in terms of small differences in the three distribution coefficients. This expression he subsequently modified in order to make it applicable at all levels of brightness. Dr. Stiles suggested a further modification, as a result of experimental work which he had recently been carrying out at the National Physical Laboratory. In this the observer was required to look at an ordinary bipartite field, one half of which was illuminated by monochromatic light of some given wavelength, while the other half received a mixture of this light with a small quantity of light of another wave-length. The observer had to note the point at which the two halves of the field appeared to differ. The modified Helmholtz expression derived from the results of this work was in accord with the visibility curve obtained by Gibson and Tyndall by the step-by-step method. This showed a considerable departure from the international visibility curve in the blue part of the spectrum. In conclusion, Dr. Stiles said that while recent work by several investigators had greatly increased our knowledge of the eye's ability to detect differences of colour, the interpretation of the results in terms of the trichromatic theory was still uncertain; it appeared, however, that a modification of the Helmholtz theory gave the best results.

A very informal discussion followed the lecture. Dr. W. D. Wright said that he felt somewhat unhappy about much of the work on colour discrimination because all the experiments did was to measure the change of stimulus which produced a just noticeable difference in the sensation, and we did not know anything at all about the magnitude of this just noticeable difference and its possible variation over the field being explored. Mr. Donaldson asked whether the theory was yet able to provide a basis for colour specifications, as it was frequently most important that we should be able to specify unambiguously the tolerance permissible in a specified colour. The lecturer replied that he felt that much more work was needed before this position could be reached; for one thing we had quite inadequate knowledge of the extent of individual variations.

* A summary of this lecture appeared in our last issue (December, 1945, p. 178).

Paint as an Output Stimulant

A useful contribution under the above title by Mr. John D. Spooner appears in "Paint Manufacture" (October, 1945). The author views the application of paint from the "light" standpoint, stating reflecting powers for different colours and giving instances of "selective painting" of industrial interiors with a view to avoiding monotony of effect. Such methods have been brought to a high pitch by the Du Pont and other organisations in America, standard colour combinations for different industries—textile, engineering, laundry, weaving, etc.—being mentioned. The author also, very wisely, reminds readers that the appearance of all such colours depends upon the sources of light by which they are illuminated; in other words, the scheme of decoration and the lighting system should be considered conjointly.